

REMARKS

The Office Action dated November 18, 2005, has been received and reviewed.

Claims 1-33 are currently pending and under consideration in the above-referenced application. Each of claims 1-33 stands rejected.

Reconsideration of the above-referenced application is respectfully requested.

Obviousness-Type Double Patenting Rejection

Claims 1-16, and 21-33 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11, 13-15, 16, 17, 19-21, 23, 28, 24-27, and 29-31 of U.S. Patent 6,869,828.

A terminal disclaimer and the appropriate fee are being filed herewith, in compliance with 37 C.F.R. § 1.321(b) and (c), to obviate the obviousness-type double patenting rejection, thereby expediting prosecution of the above-referenced application and avoiding further expense and time delay. The filing of a terminal disclaimer in the above-referenced application should not be construed as acquiescence on the propriety of the obviousness-type double patenting rejection.

Rejections under 35 U.S.C. § 103(a)

Claims 1-33 stand rejected under 35 U.S.C. § 103(a).

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Fogal

Claims 1-4, 11-14, 16-18, 20-22, 24, 25, 31, and 32 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in U.S. Patent 5,323,060 to Fogal, *et al.* (hereinafter “Fogal”).

Fogal teaches multi-chip modules (MCMs). An MCM according to Fogal includes an adhesive layer 38 interposed between two semiconductor chips 18 and 28 that have been superimposed relative to one another. *See, e.g.*, col. 2, lines 13-18, 49-54; FIG. 1. The adhesive layer 38 may be formed from an epoxy or an adhesive-coated tape. Col. 2, lines 67-68; FIG. 1. The material may be electrically insulating. Col. 3, lines 8-9; FIG. 1. The adhesive layer of Fogal has a thickness (*e.g.*, 0.008 inch) that is greater than a loop height of bonding wires 44 that protrude above an active surface of the lower of the stacked semiconductor devices. Col. 2, lines 23-27, lines 60-63; Col. 3, lines 3-5; FIG. 1.

It is respectfully submitted that there are at least two reasons that a *prima facie* case of obviousness has not been established against any of claims 1-4, 11-14, 16-18, 20-22, 24, 25, 31, or 32.

First, it is respectfully submitted that Fogal does not teach or suggest each and every element of either independent claim 1 or independent claim 16. Among other things, Fogal does not teach or suggest a method that includes applying a substantially predetermined volume of adhesive to a first semiconductor to space a surface of a second semiconductor a predetermined distance from a surface of a first semiconductor device. Instead, Fogal teaches that the adhesive 38, whether tape or epoxy, may have length and a width that falls *anywhere* within the central area 24 defined by the bonding pads 26. Col. 2, lines 53-54; FIG. 2. Similarly, the height of the adhesive 38 may be *any* height greater than the loop height 48 of the bonding wires 44. Col. 2, lines 60-63. For those instances in which tape is used as an adhesive, it is the thickness of the tape and, to a much lesser extent, the amount of adhesive on the tape that define the distance. Moreover with respect to adhesive materials that are not carried by tape, Fogal does not teach or suggest that substantially a predetermined volume of epoxy or any other adhesive material spaces a surface of a first semiconductor device substantially a predetermined distance apart from a surface of a second semiconductor device. The epoxy need not be applied to the surface of the

first semiconductor device in substantially a predetermined volume for the resulting element to space a second semiconductor device a predetermined distance from the surface of the first semiconductor device and to define an adhesive perimeter 42. Instead, viscous epoxy (of no particular volume) could be applied to the surface of the first semiconductor device, then the second semiconductor device positioned on the viscous epoxy and forced downward until the first and second semiconductor devices are spaced the predetermined distance apart from one another.

Moreover, to establish a *prima facie* case of obviousness, the Office must “provide some suggestion of the desirability of doing what the inventor has done.” M.P.E.P. § 2142; *see Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985) (“examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the reference”). “A statement that modifications of the prior art to meet the claimed invention would have been “well within the ordinary skill of the art at the time the claimed invention was made”...is not sufficient.” *See Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993); M.P.E.P. § 2143.01(IV). Fogal, without improperly relying upon the specification, does not provide a suggestion or motivation to modify the reference in the proposed manner and the Office has not provided a convincing line of reasoning as to why one of ordinary skill in the art would have been motivated to modify the teachings of Fogal in such a way as to render obvious the subject matter recited in either independent claim 1 or 16.

Therefore, in view of the foregoing arguments, a *prima facie* case of obviousness has not been established against either independent claim 1 or independent claim 16. As such, the withdrawal of the 35 U.S.C. § 103(a) rejection of independent claims 1 and 16 is respectfully requested.

Claims 2-4, and 11-14 are each allowable, among other reasons, for depending directly or indirectly from independent claim 1, which is allowable.

Claim 4 is additionally allowable because Fogal does not teach or suggest a method that includes placing a semiconductor device on discrete conductive elements (*e.g.*, bond wires 44) that extend partially over a surface of another semiconductor device.

Claim 12 is additionally allowable because Fogal does not teach or suggest a method that includes using the adhesive material to draw the second semiconductor device toward a first semiconductor device until the two semiconductor devices are spaced substantially a set distance apart.

Claims 17, 18, 20-22, 24, 25, 31, and 32 are allowable as each depends either directly or indirectly from allowable independent claim 16, among other reasons.

Claim 25 is additionally allowable because Fogal does not teach or suggest a method that includes using a predetermined volume of adhesive material to draw one semiconductor device toward another until the two semiconductor devices are spaced substantially a set distance apart from one another.

Lee in View of Ogawa

Claims 1-4, 11-18, 20-25, and 31-33 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in U.S. Patent 6,388,313 to Lee, *et al.* (hereinafter “Lee”), in view of teachings from U.S. Patent 4,388,128 to Ogawa, *et al.* (hereinafter “Ogawa”).

Lee teaches that an adhesive layer 23 may be coated onto a surface of a first semiconductor chip 21, including over gold wires 22 that extend partially over the first semiconductor chip 21. Col. 5, lines 22-32. “Wrapping” the gold wires 22 in this manner purportedly “prevent[s] the first set of gold wires 22 from being damaged by the mounting of the second semiconductor chip 24 onto the first semiconductor chip 21.” Col. 5, lines 50-59. In view of this concern, it is presumed that the adhesive layer 23 absorbs some of the force that is applied to the second semiconductor chip 24 to adhere the same in place over the first semiconductor chip 21 and to space the first and second semiconductor chips 21 and 24 a desired distance apart from one another. Further, it is the heights of the bond wires 22 that defines, in part, the distance that surfaces of the first and second semiconductor devices are spaced apart from one another, not a predetermined amount of adhesive 23. Col. 5, lines 41-43.

The teachings of Ogawa are directed to a process in which movement of upper and lower stages 123 and 121 toward one another forces two chips 120 and 122 (a color image sensor and a

color filter) toward one another and spreads a drop of adhesive 124 between the chips 120 and 122 to a desired thickness to space the chips 120 and 122 a particular distance apart from one another. Col. 9, lines 64-68; col. 10, lines 1-26. While the adhesive is dispensed “by a suitable dispenser means...[that] is capable of dispensing a predetermined amount of adhesive” (col. 10, lines 1-3), it is forcing the two chips 120 and 122 together, not the predetermined amount of adhesive, that defines the distance that surfaces of the two chips 120 and 122 are spaced apart from one another. A subsequent processing step may then be required to remove excess adhesive. Col. 11, lines 18-29. Finally, the space between chips 120 and 122 may be manipulated by an operator “so as to attain the correct alignment or registration” between the chips 120 and 122. Col. 10, lines 62-64. Thus, an operator manipulates the spacing between the chips instead of substantially a predetermined amount of adhesive defining the distance between their surfaces.

It is respectfully submitted that there are at least two reasons that teachings from Lee and Ogawa do not support a *prima facie* case of obviousness against any of the claims of the above-referenced application.

First, neither of these references teaches or suggests that substantially a predetermined volume of adhesive material spaces surfaces of two or more semiconductor devices substantially a predetermined distance apart from one another. Instead, the teachings of Ogawa are limited to spreading a “suitable” amount of adhesive between two elements that are pushed toward one another to spread the adhesive material, possibly beyond the peripheries of the chips, and manipulating the alignment of the chips to define a distance between the two semiconductor devices. Col. 9, line 64-68; Col. 10, lines 1-26, 58-68. The teachings of Lee appear to be similarly limited, as Lee indicates that an adhesive layer 23 prevents gold wires 22 from being damaged as a second semiconductor chip 24 is positioned over a first semiconductor chip 21. Col. 5, lines 50-59. Such techniques may be effected to space two elements a particular distance apart from one another regardless the amount of adhesive material that has been applied to one of the elements, thus neither Lee nor Ogawa teaches or suggests a method that includes using substantially a predetermined amount of adhesive to space a surface of a semiconductor device substantially a predetermined distance from a surface of another semiconductor device.

Second, one of ordinary skill in the art wouldn't have been motivated to combine the teachings of Lee and Ogawa in the asserted manner. Even assuming, *arguendo*, that Lee and Ogawa teach all of the elements of the independent claims, which Applicants do not concede, "a statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed invention was made"...is not sufficient without some objective reason to combine the teachings of the references." *See Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993); M.P.E.P. § 2143.01(IV). Neither Lee nor Ogawa, however, provide a suggestion or motivation to modify or combine the references in the proposed manner. This is because the teachings of Lee are drawn to techniques for stacking semiconductor devices to form multi-chip modules, while Ogawa teaches processes for bonding filters to color image sensors. *See, e.g., Wang Lab., Inc. v. Toshiba, Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993) (reference to a SIMM not necessarily in the same field of endeavor merely because it related to memories); M.P.E.P. § 2141.01(a)(V). Without improperly relying upon the specification or claims of the above-referenced application for its motivation to combine teachings from Lee and Ogawa in the asserted manner, the Office has not provided a convincing line of reasoning as to why one of ordinary skill in the art would have been motivated to modify or combine the teachings of Lee and Ogawa in such a way as to render obvious the subject matter recited in either independent claim 1 or 16.

Therefore, withdrawal of the 35 U.S.C. § 103(a) rejections of independent claims 1 and 16 is respectfully requested.

Claims 2-4 and 11-15 are each allowable for depending either directly or indirectly from allowable independent claim 1, among other reasons.

Claim 4 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes placing a semiconductor device on discrete conductive elements (*e.g.*, bond wires 44) that extend partially over a surface of another semiconductor device.

Claim 12 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes using the adhesive material to draw the second semiconductor device toward a first semiconductor device until the two semiconductor devices are spaced substantially a set distance apart.

Claim 15 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes substantially hardening an adhesive to decrease the distance between two semiconductors, among others.

Claims 17, 18, 20-25, and 31-33 are allowable as each depends either directly or indirectly from allowable independent claim 16, among other reasons.

Claim 25 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes using a predetermined volume of adhesive material to draw one semiconductor device toward another until the two semiconductor devices are spaced substantially a set distance apart from one another.

Claim 33 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes substantially hardening an adhesive to decrease the distance between two semiconductors, among others.

Lee and Ogawa in View of Fujisawa

Claims 5-10, 19 and 26-30 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in Lee and Ogawa as applied to claims 1-4, 11, 13-18, 20-25 and 31-33 above, and further in view of U.S. Patent 5,801,439 to Fujisawa, *et al.* (hereinafter “Fujisawa”).

Claims 5-10 are each allowable for depending either directly or indirectly from allowable independent claim 1, among other reasons.

Claims 19 and 26-30 are each allowable for depending either directly or indirectly from allowable independent claim 16, among other reasons.

It is further submitted that teachings from Lee, Ogawa, and Fujisawa cannot be relied upon to establish a *prima facie* case of obviousness against any of the claims of the above-referenced application.

The teachings of Fujisawa are directed to packaged semiconductor devices with leads 85, 85(b) that extend along at least portions of the exterior surfaces of the molded packages thereof. *See, e.g.*, FIG. 18. These packaged semiconductor devices 82 may be stacked relative to one another and secured to each other with adhesive material 101. *See, e.g.*, Col. 20, lines 52-65;

FIG. 18. Corresponding leads of adjacent packages contact and communicate with one another. Fujisawa, however, does not teach or suggest applying substantially a predetermined quantity of adhesive material to a surface of a semiconductor device, among others.

Furthermore, it is respectfully submitted that one of ordinary skill in the art wouldn't have been motivated to combine the teachings of Lee, Ogawa, and Fujisawa in the manner that has been asserted. As set forth above, neither Lee nor Ogawa provides any suggestion or motivation to combine their teachings, nor has the provided a convincing line of reasoning why one skilled in the art would be so motivated. Similarly, Fujisawa does not provide a suggestion or motivation to combine its teachings with those of Lee or Ogawa. Further, Fujisawa does not include any teaching or suggestion that would remedy the aforementioned deficiencies in the asserted combination of teachings from Lee and Ogawa. Moreover, none of Lee, Ogawa, or Fujisawa includes any teaching or suggestion that substantially a predetermined volume of adhesive material may space surfaces of two or more semiconductor devices substantially a predetermined distance apart from one another.

Therefore, it is apparent that the only source of motivation to combine the teachings of Lee, Ogawa, and Fujisawa would have been the disclosure of the above-referenced application, which would constitute improper hindsight.

Claim 6 is additionally allowable as none of Lee, Ogawa, or Fujisawa teaches or suggests a method that includes introducing an adhesive to force a second semiconductor away from a first semiconductor and to space the surface of the second semiconductor apart from the conductive elements of the first semiconductor.

Claim 10 is additionally allowable as none of Lee, Ogawa or Fujisawa teaches or suggests a method that includes substantially hardening an adhesive to decrease the distance a first semiconductor is spaced from a second semiconductor.

Claim 29 is additionally allowable as none of Lee, Ogawa or Fujisawa teaches or suggests a method that includes introducing an adhesive that pushes a second semiconductor device away from a first semiconductor device.

For these reasons, it is respectfully submitted that a *prima facie* case of obviousness has not been established against any of claims 5-10, 19, and 26-30. Therefore, the withdrawal of the 35 U.S.C. § 103(a) rejections of these claims is respectfully requested

Lin in View of Ogawa

Claims 1-4, 11-18, 20-25, and 31-33 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in U.S. Patent 6,333,562 to Lin (hereinafter “Lin”), in view of teachings from Ogawa.

Lin teaches processes for spacing the semiconductor dice of stacked multichip modules predetermined distances apart from one another. In the disclosed processes, conductive bumps 350 that include pillar protruding portions 350b are formed on bond pads of a lower semiconductor die 310. Col. 5, lines 9-14; col. 6, lines 1-6; FIGs. 5, 8. An adhesive material is then introduced onto the active surface of the lower semiconductor die 310 to form an adhesive layer 340 thereon. Col. 5, lines 40-50; col. 6, lines 23-28; FIGs. 7, 10. Another semiconductor die 320 is positioned over the lower semiconductor die 310, in contact with adhesive layer 340, and forced toward the lower semiconductor die 310 until the backside thereof contacts the pillar protruding portions 350b of bumps 350. *Id.*

Ogawa, as set forth above, teaches methods for bonding color filters to color image sensors. These methods include applying adhesive to the sensors, then forcing the filters and the sensors toward one another and manipulating their alignment and displacement.

It is respectfully submitted that there are at least two reasons that the teachings of these references do not support a *prima facie* case of obviousness against any of claims 1-4, 11-18, 20-25, or 31-33.

First, neither Lin nor Ogawa teaches or suggests each and every element of either independent claim 1 or 16. With respect to claim 1, neither Lin nor Ogawa teaches or suggests a method that includes “applying substantially a predetermined volume of adhesive material onto at least an active surface of a first semiconductor device . . .,” which ultimately spaces the first semiconductor device apart from a second semiconductor device by substantially a predetermined distance. Similarly, with respect to claim 16, neither Lin nor Ogawa teaches or

suggests a method that includes “applying substantially a predetermined volume of adhesive material onto at least a surface of [a] first semiconductor device . . .,” which ultimately results in the surface of the first semiconductor device being spaced substantially a predetermined distance apart from an opposing surface of a second semiconductor device.

When the processes taught in Lin and Ogawa are employed, it does not matter how much (*i.e.*, the volume of) adhesive material that is applied to the surface of a semiconductor device. Rather, in Lin, the amount of force applied to an upper chip 320, the height of pillar protruding portions 350b that protrude from a lower chip 310, or a combination thereof dictates the distance that two stacked semiconductor devices (*i.e.*, chips 310 and 320) are spaced apart from one another. In Ogawa, an operator manipulating the displacement and alignment, as well as the force applied, regulates the distance apart that the chips 120 and 122 are spaced, with excess adhesive squeezed beyond the periphery of the chips. Therefore, Lin and Ogawa, taken either separately or together, do not teach or suggest applying “substantially a predetermined quantity of adhesive material” to at least a surface of a semiconductor device or that substantially the predetermined quantity of adhesive material spaces the surface of the semiconductor device a predetermined distance or substantially a predetermined distance apart from another surface of another semiconductor device, as is required by independent claims 1 and 16. As Lin and Ogawa do not teach or suggest each and every element of either independent claim 1 or independent claim 16, under 35 U.S.C. § 103(a), both of these claims recite subject matter which is allowable over the subject matter taught in Lin and Ogawa.

Moreover, one of ordinary skill in the art would not have been motivated to combine the teachings of these references in the manner that has been asserted. Neither Lin nor Ogawa provide a suggestion or motivation to modify or combine the references in the proposed manner. This is because the teachings of Lin are drawn to techniques for stacking semiconductor devices to form multi-chip modules, while Ogawa teaches processes for bonding filters to color image sensors. *See, e.g., Wang Lab., Inc. v. Toshiba, Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993); M.P.E.P. § 2141.01(a)(V). Without the benefit of hindsight that the specification and claims of the above-referenced provide to the Office, one of ordinary skill in the art wouldn’t

have been motivated to combine teachings from Lin and Ogawa in the manner that has been asserted..

Therefore, withdrawal of the 35 U.S.C. § 103(a) rejections of independent claims 1 and 16 is respectfully requested.

Claims 2-4, 11-15 are each allowable for depending either directly or indirectly from allowable independent claim 1, among other reasons.

Claim 12 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes using the adhesive material to draw the second semiconductor device toward a first semiconductor device until the two semiconductor devices are spaced substantially a set distance apart.

Claim 15 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes substantially hardening an adhesive to decrease the distance between two semiconductors, among others.

Claims 17, 18, 20-25, and 31-33 are allowable as each depends either directly or indirectly from allowable independent claim 16, among other reasons.

Claim 25 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes using a predetermined volume of adhesive material to draw one semiconductor device toward another until the two semiconductor devices are spaced substantially a set distance apart from one another.

Claim 33 is additionally allowable because neither Lee nor Ogawa teaches or suggests a method that includes substantially hardening an adhesive to decrease the distance between two semiconductors.

CONCLUSION

It is respectfully submitted that each of claims 1-33 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Serial No. 10/770,890

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Brick G. Power", with a long horizontal flourish extending to the right.

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Date: February 21, 2006
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